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DUANE MORRIS LLP IP DEPARTMENT (TSMC) 30 SOUTH 17TH STREET PHILADELPHIA, PA 19103-4196			RUGGLES, JOHN S	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 10/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/730,533	Applicant(s) CHANG ET AL.	
	Examiner John Ruggles	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 8/10/06 & 6/26/06.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-7 and 9-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-7 and 9-16 is/are rejected.
- 7) ☒ Claim(s) 9-16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

In the current 6/26/06 submission, the proposed replacement drawings sheets numbered 1-9 of 9 were found to be non-compliant and have therefore not been entered, because each was lacking proper identification as a "Replacement Sheet". However, all other parts of this current submission have been entered. Claims 1, 3-5, 7, 9-10, and 13-15 are currently amended, claims 2, 8, and 17-22 are currently canceled, and claims 6, 11-12, and 16 remain as originally filed.

In the current 8/10/06 submission, the proposed replacement drawings sheets numbered 1-9 of 9 have rectified the previous drawings non-compliance and have therefore been entered.

The previous objections to the drawings are withdrawn in view of Applicants' current amendments and accompanying remarks, as stated below.

The 6/26/06 amended title of the invention is improved, but it is still not fully descriptive of the claimed invention as enabled by the original specification for the reasons given below.

The abstract of the disclosure is again objected to, which is indicated below.

The previous specifically exemplified reasons for objection to the specification numbered (1)-(4) are withdrawn in view of current amendments and accompanying remarks. However, further examples of reasons for objection to the specification remain, as listed below.

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While most of the previous objections to the claims are withdrawn in view of the current amendments and accompanying remarks, the previous objection to claim 16 is not overcome and is therefore maintained below.

The previous rejections of instant claims under the second paragraph of 35 U.S.C. 112 are withdrawn in view of current amendments and accompanying remarks. However, the current amendments have also necessitated new rejections under both the first and second paragraphs of 35 U.S.C. 112, as set forth below.

The previous prior art rejections of instant claims under 35 U.S.C. 102(e) and 35 U.S.C. 103(a) have been revised as shown below.

Applicants' current amendment(s) have necessitated the new ground(s) of rejection presented in this Office action, which is accordingly made FINAL as indicated below.

Drawings

The previous objections to the drawings are withdrawn in view of Applicants' current amendments and accompanying remarks.

Specification

Applicants state on page 11 of the current 6/26/06 submission that the specification filed on 5/7/04 was not intended to substitute for the original specification. Accordingly, the previous objection to the 5/7/04 specification is withdrawn, but the status of this specification remains as not entered.

The 6/26/06 amended title of the invention is improved, but it is still not fully descriptive of the claimed invention as enabled by the original specification (at e.g., paragraph [0018] lines 3-4, [0025] lines 18-19, etc.) that describes the instant patterned

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phase shifting mask (PSM) to have *no* chrome. While Applicants now assert for the first time on page 12 of their 6/26/06 submission that “certain embodiments include chrome”, they fail to show any specific support for this assertion by pointing to even a single specific example of a finished patterned chrome PSM anywhere in the original specification. Instead, [0029] lines 4-6 of the original specification expressly describe employing a “**chromeless** phase shifting mask” (emphasis added), which clearly shows original support for a chromeless PSM.

In order to resolve this issue, the following amended title would be appropriate: --
 CLEAR FIELD ANNULAR EQUAL LINE SPACE CHROMELESS PHASE
 SHIFTING MASK AND METHODS OF MANUFACTURING THE SAME--.

The abstract of the disclosure is again objected to because: (1) (a) in line 4, “said substrate” should be corrected to --[[said]] the mask substrate--; (b) in line 6, “said mask substrate” should be corrected to --[[said]] the mask substrate--; (c) in line 7, “said resist layer” should be corrected to --[[said]] the resist layer--; (3) in lines 2-3 and 9-10, “a substantially unexposed region” should be changed to --[[a]] substantially an unexposed region--, at both occurrences in accordance with [0028] lines 5-6 of the original specification; (4) (a) in line 1, “A mask” should be changed to --A chromeless phase shifting mask--; (b) in line 3, “a mask” should be changed to --a chromeless phase shifting mask--, both of which are supported by [0029] lines 4-6 of the original specification; (5) in lines 5-6, “patterning at least one annular equal line space phase shifting pattern on the resist layer; patterning the resist layer pattern onto” should be amended to --patterning the resist layer; patterning at least one annular equal line space phase shifting pattern on ~~the resist layer; patterning the resist layer pattern onto~~--, because

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the resist layer does not function as a phase shifting pattern; and (6) the entire last sentence at lines 7-10 should also be deleted, since this sentence only relates to an embodiment that is now canceled from the instant claims. Correction is again required. See MPEP § 608.01(b).

The amendment filed 6/26/06 is objected to under 35 U.S.C. 132(a) because it is believed to have introduced new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not believed to be supported by the original disclosure is as follows: the specification does not reasonably provide enablement for the extended scope now recited in claim 1 lines 2-5 to include a PSM intended to produce “a *substantially* unexposed” (emphasis added) region on a semiconductor substrate.

Applicant is required to cancel the new matter in the reply to this Office Action.

35 U.S.C. 112, first paragraph, requires the specification to be written in “full, clear, concise, and exact terms.” The specification is replete with terms, which are not clear, concise and exact. The specification should again be revised carefully in order to fully comply with 35 U.S.C. 112, first paragraph. Examples of some remaining unclear, inexact or verbose terms used in the specification are: (5) in [0030] lines 1-2, “interconnect lines 520, 530, and 540” should be changed to --interconnect lines 520, 530, [[and]] 540, 550, 560, and 570--, in order to coordinate with the current amendment of lines 2-3 in this same paragraph for inclusion of all six corresponding lines on the mask; (6) in [0008] lines 2-3 and 8, “an opaque region on a semiconductor substrate” should be corrected to --~~an opaque~~ a dark region on a semiconductor substrate--, at both occurrences as well as throughout the specification at all other applicable locations

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(alternatively, each occurrence of “an opaque region on a semiconductor substrate” can instead be changed to --an ~~opaque~~ unexposed region on a semiconductor substrate--, as also being supported by [0028] lines 5-6 of the original specification, as pointed out above); and (7) in [0019] line 10, “for example 0” should be clarified to --for example 0 degrees--. Note that due to the number of errors, those listed here are merely examples of the corrections needed and do not represent an exhaustive list thereof.

Appropriate correction is again required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

Claim Objections

Claims 9-16 are objected to because of the following informalities: (1) in claim 16, “said pattern” must still be corrected to --said at least one annular equal line space phase shifting pattern-- and (4) in claim 9 line 9 and in claim 10 line 11, “pattern being” should be changed to --pattern [[being]] is--, at both occurrences. Claims 11-16 depend on claim 10. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The previous rejections of instant claims under the second paragraph of 35 U.S.C. 112 are withdrawn in view of current amendments and accompanying remarks. However, the current amendments have also necessitated new rejections under both the first and second paragraphs of 35 U.S.C. 112, as set forth below.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

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art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 and 3-7 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the invention as now claimed. The original specification at [0028] lines 5-6 and [0029] lines 4-6, while being enabling for a chromeless PSM intended to produce an unexposed region on a semiconductor substrate, the specification does not reasonably provide enablement for the extended scope now recited in claim 1 lines 2-5 to include a PSM intended to produce “a *substantially* unexposed” (emphasis added) region on a semiconductor substrate. The original specification is not believed to support the newly coined phrase “a *substantially* unexposed”, suggesting that this phrase represents new matter. For the purpose of this Office action, claim 1 is interpreted in accordance with the original specification to mean a chromeless PSM intended to produce --[[a]] *substantially* an unexposed-- region on a semiconductor substrate. Claims 3-7 depend on claim 1.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which Applicants regard as the invention.

In claim 9 line 10 and in claim 10 lines 12-13, the phrase “said semiconductor substrate” lacks antecedent basis at both occurrences. Claims 11-16 depend on claim 10.

Claim Rejections - 35 USC § 102/103

The previous prior art rejections of instant claims under 35 U.S.C. 102(e) and 35 U.S.C. 103(a) have been revised as shown below.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1 and 3-7 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sivakumar et al. (2004/0101765).

Sivakumar et al. teach chromeless phase shift lithography (CPL) masks (chromeless PSMs) and methods of using them for patterning large line/space geometries (title, abstract). CPL masks have adjacent transparent 0° non-PS regions and 180° PS regions to generate a phase edge between the PS and non-PS regions that is darkened in the resist aerial image by destructive interference of light diffracted from the 0° and 180° regions immediately on either side of the phase edge (paragraph [0003], instant claims 3, 5, and 7). The PS features can be recesses or mesas patterned on a quartz mask substrate (instant claim 6, e.g., by etching, etc. [0026]). Figure 6D (Option D) shows a chromeless PSM having a “bulls eye” configuration including a central PS square portion 604 that is surrounded by a first annular non-PS ring 608, which is further surrounded by another outer annular PS ring 606 [0029]. The Figure 6D chromeless PSM is very similar to that shown by instant Figure 1A. The interspersed or alternating PS and non-PS regions (including the central square and surrounding annular rings that make up an annular equal line space PS pattern) are each physically small enough and placed close enough together to ensure that the aerial images of the individual features merge to provide a combined aerial image capable of patterning a large resist structure ([0030], that is darkened or

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unexposed on the resist, reading on instant claim 4). To produce an ideal deep single minimum aerial image intensity on a resist using 193 nm exposure light, the phase edge separation or the line width on the chromeless PSM should be $0.1\mu\text{m}$ (100nm [0004], corresponding to a pitch on the mask (P_m) of 200nm for PS lines separated by an intermediate non-PS line of the same width as the PS lines). An exemplary modern integrated circuit (IC) has lines with a base width (or critical dimension, CD) of $0.25\mu\text{m}$ (250nm) or other features such as pads having larger widths [0025], corresponding to a resist image (e.g., on a semiconductor substrate, etc.) having a pitch (P_{cs}) of 500nm or larger). Applying $P_m = 200\text{nm}$ and $P_{cs} \geq 500\text{nm}$ for a common 4X mask ($N=4$) to the instant expression $P_m < N \times 2P_{cs}$ (instant [0023] for a mask pattern pitch smaller than two times a corresponding critical dimension pitch on a semiconductor substrate as instantly claimed) would yield $200\text{nm} < 4 \times 2 (500\text{nm})$ or $200\text{nm} < 4,000\text{nm}$ (reading on instant claim 1). Therefore, one of ordinary skill in the art at the time of the instant invention would have a reasonable expectation of success in patterning a resist by a chromeless PSM having an annular equal line space PS pattern with a mask pitch (P_m , e.g., 200nm, etc.) that is smaller than two times a corresponding CD pitch (P_{cs} , e.g., 500nm, etc.) on a semiconductor substrate. In fact, a chromeless PSM having a suitable pattern of interspersed or alternating PS and non-PS regions (including a central square and surrounding annular rings that make up an annular equal line space PS pattern) that are each physically small enough and placed close enough together to ensure that the aerial images of the individual features merge to provide a combined aerial image would be inherently capable of forming a large area resist pattern or structure (as taught by Sivakumar et al.).

Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivakumar et al. (2004/0101765) in view of either Dao et al. (5,302,477) or Schroeder et al. (2003/0027057).

While teaching other aspects of the instant claims including selective etching of an annular equal line space pattern in a quartz substrate for making a chromeless PSM, as discussed above, Sivakumar et al. do not specifically teach patterning a resist layer on the PSM substrate before etching through the patterned resist layer and removing the remaining resist layer after etching (instant claim 9). Also, Sivakumar et al. do not specifically teach using a conductive chrome layer (e.g., as an etching mask, etc.) between the PSM substrate and the patterned resist to manufacture the PSM (instant claim 10).

Dao et al. teach an inverted phase-shifted reticle or mask (PSM) having adjacent inverted phase features with PS rims or phase edges between 0° and 180° phase features; and methods of fabricating the PSM (title, abstract). The methods of fabricating the PSM include performing patterning or etching of a (conductive) chrome (Cr) mask layer 21 (instant claim 12) formed on a transparent quartz substrate 20 (as shown in Figure 7, instant claim 11) through an overlying patterned photoresist or resist layer 51, patterning or etching of the quartz substrate 20 through the patterned Cr 21, and removing remaining resist layer 51 (as shown in Figure 8, col. 8 lines 46-69). A remaining portion of the Cr 21 is also removed (as shown in Figures 9 and 10, which is a cross-sectional view of the annular ring patterned PSM shown in Figure 5A, col. 9 lines 9-12, instant claim 10). An alternative method includes directly etching the PSM transparent quartz substrate 20 through an overlying patterning layer 125 (e.g., of resist, etc.) followed by

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removal of the remaining patterning layer or resist layer 125 (as shown in Figures 27 and 28, col. 11 lines 36-57, instant claim 9).

Schroeder et al. teach a phase shift mask 400 (PSM) and method of manufacturing the PSM (abstract). Figure 6A shows a PSM 400 having a transparent quartz substrate 402 (instant claim 11) with a first etched region 458 for a 180° phase feature and adjacent second unetched region 460 for a 0° phase feature (paragraphs [0041-0047]). In the method of manufacturing the PSM, a (conductive) chrome (Cr) layer 404 (instant claim 12) is preferably formed on the transparent substrate and patterned before etching of the underlying transparent substrate [0043]. The method for making the PSM in Figure 6A would be expected to involve patterning of an opening in the Cr layer through an overlying patterning layer (e.g., of resist, etc.), removal of remaining patterning layer or resist layer, etching of the underlying transparent substrate at a first region 458 through the opening in the Cr layer, and removal of a remaining portion of the Cr layer that forms a second adjacent region 460 (instant claim 10). Alternatively, the method of making the PSM can exclude the use of a Cr layer 404 ([0043] lines 4-5, which suggests that the PSM transparent quartz substrate 402 can be etched directly through an overlying patterning layer (e.g., of resist, etc.) followed by removal of a remaining patterning layer or resist layer, instant claim 9).

It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture a chromeless PSM including a central portion and surrounding annular rings that make up an annular equal line space PS pattern having a mask pitch that is smaller than two times a corresponding CD pitch on a semiconductor substrate (taught by Sivakumar et al. as discussed above) by etching PS features between non-PS

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features into the transparent substrate of the chromeless PSM either directly through an overlying patterned resist or indirectly through an overlying patterned resist and intermediate patterned or etched Cr layer, as exemplified by either Dao et al. or Schroeder et al. This is because both of these direct and indirect etching methods for manufacturing etched phase shifters in a transparent mask substrate to make a PSM have been well known for their advantages in the art for some time, as exemplified by either Dao et al. or Schroeder et al. (instant claims 9-15).

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sivakumar et al. (2004/0101765) in view of Lee et al. (5,240,796).

While teaching other aspects of the instant claim including selective patterning of an annular equal line space pattern on a quartz substrate for a chromeless PSM having a mask pitch that is smaller than two times a corresponding CD pitch on a semiconductor substrate (as discussed above), Sivakumar et al. do not specifically teach disposing added phase shifting (PS) material on the mask substrate through a patterned conductive layer (e.g., as a coating mask, etc.).

However, Lee et al. teach a method that has been known for some time to fabricate a chromeless phase shift reticle or mask (chromeless PSM) having a pattern of added PS material portions at a thickness to achieve a PS of 180° for light passing through the PS portions relative to light transmitted through non-PS (0°) portions of the transparent mask substrate (title, abstract, issue date). The method includes depositing a conductive or metallic layer 40 (e.g., of Cr, etc.) on a transparent mask substrate 30 (e.g., of quartz, etc.), forming a photoresist or resist layer 44 on the conductive Cr layer (as shown in Figure 3A, col. 4 line 61 to col. 5 line 38), patterning the resist layer 44,

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anisotropic dry etching of the Cr layer to form patterned portions 48 with openings 46 having vertical sidewalls, and removing the remaining resist layer 44 (as shown in Figure 3B, col. 5 lines 38-51). Next, a PS material 50 (e.g., of silicon dioxide (SiO_2), silicon nitride (SiN), etc.) is blanket or conformally deposited on the patterned conductive Cr layer 48 to fill the openings 46 therein (as shown in Figure 3C, col. 5 line 52 to col. 6 line 7). Then, the PS material 50 is planarized down to the same thickness as the patterned conductive Cr layer 48 (as shown in Figure 3D, col. 6 lines 8-13) followed by etching away the patterned conductive Cr 48 to form patterned PS portions 52 having vertical sidewalls with intervening transmissive areas 54 on the transparent mask substrate (as shown in Figure 3E, col. 6 lines 29-37, which reads on instant claim 16).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture a chromeless PSM including a central portion and surrounding annular rings that make up an annular equal line space PS pattern having a mask pitch that is smaller than two times a corresponding CD pitch on a semiconductor substrate (taught by Sivakumar et al. as discussed above) by patterning added PS features (instead of etching PS features) between non-PS features on the transparent substrate of the chromeless PSM through an overlying patterned resist and an intermediate patterned or etched temporary conductive Cr layer as a coating mask, because this would reasonably be expected to achieve vertical sidewalls for added PS features on the chromeless PSM (which has been known in the art of making chromeless PSMs for some time, as taught by Lee et al.).

Response to Arguments

It is noted that Applicants' mention of an instant Figure 1 in the last line on page 13 of the 6/26/06 submission is in error, since no such figure is found in the instant application. Also, the use of "MPEP § 706.01(IV)" on page 15 of this submission is not understood with respect to Applicants' argument regarding inherency.

Applicants' arguments with respect to the instant claims have been considered, but they are either moot or unpersuasive in view of the new and maintained ground(s) of objection and rejection set forth in this Office action.

On pages 12 and 17-18, Applicants seem to be confused about the use of Cr as a temporary etching mask (e.g., as taught by either Dao et al. or Schroeder et al., etc.) or a temporary coating mask (e.g., as taught by Lee et al., etc.) for patterning a radiation mask (such as for making a chromeless PSM, as taught by Sivakumar et al. and/or Lee et al.) versus the use of Cr as a permanent patterned light blocking layer on a radiation mask (such as a PSM that is not chromeless). Applicants must clarify their position on this issue in response to this Office action.

On pages 15-16, Applicants imply that the inclusion in Sivakumar et al. [0025] of alternative pads having widths several multiples of the base line width somehow teaches against a mask pitch that is smaller than two times a corresponding CD pitch on a semiconductor substrate. However, this implication is unpersuasive and moot in view of the revised rejections set forth above. The inclusion of larger CD pitches (Pcs) on a semiconductor substrate does not teach against the instant expression $P_m < N \times 2P_{cs}$, at least because a larger CD pitch only increases the size of Pcs without changing the mask pitch (Pm) or the relative mask size (N) for reduction exposure.

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Conclusion

Applicants' amendment(s) necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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